戸外における蠅忌避剤の効力評価法について : 忌避剤・誘引剤について 第6報

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29. 戸外における蠅忌避剤の効力評価法について

忌避剤・誘引剤について　第6報　池田安之助（三共株式会社　高峰研究所）　33. 8. 30 受理

戸外における蠅忌避剤の効力評価法として，蠅取瓶による bait trapping method を採択し，その方法と効力表示法について検討した．数種の忌避剤について実験をおこない，興味ある結果を得たが，本報では供試薬剤の効果よりも，その効力評価法について主として論じた．すなわち，薬剤処理を施した沪紙の上に蠅取瓶と餌を置き，これを戸外に設置する．忌避効果の判定は，各個の瓶に採集された蠅数を基礎として百分率をもって表示される：

$$忌避率\ \% = 100\times (n_c/N - n_i/N)/(n_c/N)$$

n は採集蠅数，i は薬剤処理区，c は対照無処理区，N は各個における採集蠅数の合計，たゞし，N は試験時における試験区域の fly population とみなす．すなわち，定数の個体を扱う室内実験とは異なり対照となる個体数が不規則であるため，一連の試験における採集蠅数の合計値（N）を扱って処理するのが適当と考えた．

Since the effectiveness of repellents were of short duration, they were not used in the insect pest control as space sprays, except for mosquitoes. Recently, however, more effective and relatively long-lasting repellents are marketed by numerous manufacturers[2], some of which play an important part in the pest control, producing satisfactory results either in economic gain or for human comfort.

At the same time, various scientific methods have been developed to determine effectiveness of these chemicals[6-7,9-13,15]. The repellent activity is, unlike that of insecticide, not determined by examining mortality or knockdown. It is emphasized that repellents must be evaluated realistically and accurately[1]. In the present paper, the author reports a method to evaluate fly repellents in outdoor by using fly bottles, and has compared the effects of some commercial repellents against certain species of flies.

The author wishes to express his appreciation to Dr. O. Shinoda, Prof. in Osaka University of Liberal Arts, for his kind guidance and encouragement given him during the course of the present work. The author is also deeply indebted to the director N. Kumasawa of this laboratory, and Mr. Y. Hamada, the chief of chemical laboratory concurrently the vice-manager of this factory for their helps and kind intentions.

Materials and Methods

The materials adopted in the experiments are effective repellents that have been currently investigated, viz., Crag fly repellent (butoxypolypropylene glycol)[14], meta Delphene (diethyltoluamide)[8], MGK repellent 11 (2,3,4,5-bis (Δ^2 butylene) tetrahydrofurfural)[4,5], and Tabutrex (di-*n*-butyl succinate)[3]. Each material is dissolved in acetone.

The method adopted is essentially a bait trapping. Tests are conducted in an area heavily infested with various species of flies outside of our rodent laboratory. Flies are caught every day during 10.00 to 16.00 except at big rainfall.

The trap, an usual fly catcher, is consisted of domed glass bottle of 20 cm in diameter, with a funnel opening of 7 cm in diameter at the bottom. Water containing a small quantity of emulsifier is poured in the circumambient trough at the base, so that flies which enter the basal opening are unable to escape.

Mashed fresh entrails of fish such as a mackerel, sardine or saurel are used as the bait. They are placed in a glass dish of 9 cm in diameter put underneath the basal funnel opening of the trap.

Round pieces of filter paper, 30 cm in diameter (706 cm^2), are soaked with 7.6cc acetone solutions of desired concentration, and, as soon as the main part of the solvent has evaporated off, a set of fly bottle and bait is placed over the treated paper respectively. The traps are kept in the shade at intervals of 20 cm.

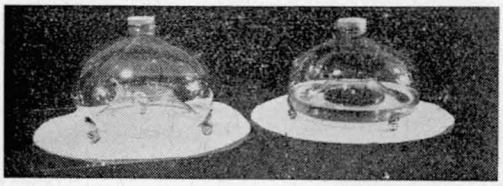

Fig. 1. Glass trap for field trapping. The trap is placed on a filter paper treated with test material. Bait is placed in a small dish underneath the funnel opening of the trap.

The collected flies are classified into larger groups, while some species considered to be important as a vector or nuisance are identified closely.

The criterion of repellency was based on the number of flies caught. A percentage of effectiveness was computed by the following formula:

$$\text{Percentage repellency} = \frac{n_c/N - n_i/N}{n_c/N} \times 100$$

N is the total number of flies collected in all traps, and, look upon N as a fly population during the test period in test area, and n_c is the number of flies collected in the check, while n_i is that of test bottle.

Sometimes appreciably larger number of flies are collected in test trap than that of the check. In such a case, the above formula is suited for the purpose, because a captured rate (n/N) is under consideration in this manner.

Results

The results are given in Table 1. The flies collected are indicated under the common names, viz., house fly (*Musca domestica vicina*), false stable fly (*Muscina stabulans*), little house fly (*Fannia canicularis*), Anthomyid flies (*Anthomyia* spp., chiefly *Ophyra calcogaster*), flesh flies (*Sarcophaga* spp.), blue bottle flies (*Calliphora vomitoria* and *Calliphora* sp.), and green bottle flies (*Lucilia caesar* and *L. sericata*).

Table 1. Percent repellency against various domestic flies by the bait trapping method. Average of three replicates.

Species	Repellency percent Dosage mg/ft^2 1000	500	250	125	62	31	Flies caught
Crag fly repellent							
House fly	92.4	72.3	71.0	39.4	0.0	0.0	163
False stable fly	87.0	81.8	75.9	42.6	0.0	0.0	120
Little house fly	70.3	75.3	64.1	44.7	11.4	0.0	430
Anthomyid fly	85.1	84.4	68.0	39.8	0.0	0.0	647
Flesh flies	75.1	70.9	50.0	16.6	0.0	0.0	54
Blue bottle flies	62.2	65.2	56.2	42.1	14.3	0.0	380
Green bottle flies	78.7	63.8	60.9	38.2	8.4	0.0	828
MGK repellent 11							
House fly		89.4	81.7	59.2	66.8	38.4	142
False stable fly		95.0	82.1	83.1	67.8	55.5	147
Little house fly		99.6	92.4	74.4	82.9	55.5	550
Authomyid fly		95.1	87.3	93.1	71.0	65.5	965
Flesh flies		—	—	—	—	—	4
Blue bottle flies		99.1	92.6	86.4	76.6	68.7	229
Green bottle flies		99.3	94.4	86.6	86.5	85.4	587
Tabutrex							
House fly		97.1	85.3	81.3	71.8	33.4	149
False stable fly		96.5	92.1	80.1	62.3	16.7	76
Little house fly		96.5	81.0	64.1	60.7	25.0	344
Anthomyid fly		93.1	89.7	78.2	41.5	26.0	564
Flesh flies		93.2	54.4	41.1	25.6	33.4	70
Blue bottle flies		94.2	77.4	57.8	43.7	0.0	295
Green bottle flies		95.6	80.6	71.8	44.6	16.7	698
Meta Delphene							
House fly		85.8	69.0	59.9	42.0	27.0	92
False stable fly		92.7	68.6	53.6	33.4	28.7	104
Little house fly		98.6	81.2	32.1	38.6	0.0	445
Anthomyid fly		92.2	80.0	69.6	49.9	0.0	285
Flesh flies		—	—	—	—	—	13
Blue bottle flies		60.2	30.4	18.1	13.8	0.0	661
Green bottle flies		80.1	60.3	30.8	24.9	0.0	708

Table 2. Comparison of four commercial repellents when used at an equivalent dosage against various species of domestic flies. Dosage applied was 250mg/ft² each. Average of five replicates.

Species	Repellency Percent				Confidence limits %	F	Number of flies caught
	Crag fly repellent	MGK repellent 11	Tabutrex	Meta Delphene			
House fly	80.7	88.0	78.3	63.1	±19.1	1.3353<	236
False stable fly	73.3	75.4	87.0	65.1	±26.2	0.5313<	190
Little house fly	63.1	85.4	81.0	78.9	±28.8	0.5090<	995
Anthomyid flies	64.5	70.2	86.4	75.0	±22.3	0.7712<	623
Flesh flies	52.7	93.3	70.5	32.9	±32.6	2.7885<	43
Blue bottle flies	57.9	92.4	74.1	18.3	±23.0	8.4304>	880
Green bottle flies	66.5	93.2	83.1	49.2	±17.1	5.6953>	1152
Confidence limits %	±27.6	±21.0	±24.9	±21.1		F^3_{16}	
F	0.4738<	0.8041<	0.2559<	4.6803>	F^6_{28}		

F^3_{16}=3.2389, F^6_{28}=2.4453, significant at 0.05 level.

In these tests, meta Delphene and Tabutrex are more effective than Crag fly repellent, whereas MGK repellent 11 is the most effective among these materials. MGK repellent 11 shows good repellency against all species when used at dosage as low as 62mg/ft². Although Crag fly repellent is relatively low in repelling effects, it may be cancelled by its low-price for practice.

The comparison of four repellents when used at an equivalent dosage are given in Table 2.

Discussion

Scientifically, the method adopted in this work may not be complete one, but it may be sufficient for practical uses.

In evaluating repellency, it is a matter for deep reflection whether the repellent competes with certain attractant occurring in nature simultaneously. In this work, dishes with mashed fresh fish are put underneath each trap during the test period. In a short time, if the attraction of food is stronger than repellent power of the chemicals, flies will swarm into the trap to be drowned in water there, while, if the repellent power is stronger than the attraction of food, they will not even approach the trap, and will fly away.

In the present work, Crag fly repellent, Tabutrex, meta Delphene, and especially MGK repellent 11 were shown to be very good repellents even at the co-presence of strong attractants, mash of fishes, to the houseflies. The use of these materials will probably change the fly fauna around the house in the near future.

Résumé

To know practicability of some commercial repellents, their repellencies against houseflies were compared by trap method in the presence of a suitable bait (mash of raw fish). It is obvious that the commercial repellents, especially MGK repellent 11 are efficient at the presence of food, so that they are recommendable for home practice.

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30. 農家の穀物倉庫における害虫の分布および季節的消長*

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米および大麦を俵積みにして収納した農家倉庫内において石鹸水トラップを使用して，害虫の倉庫内における分布，個体数の季節消長，またクロールピクリンくん蒸後の個体数，種類相の変化を調査した．

はじめに

穀物倉庫内の害虫の季節的消長および分布を定量的に調査したものはほとんどない．これはその方法に多くの困難をともなうためであったが，筆者は，従来の抜き取り法以外に，石鹸水トラップを使用することによって技術的な困難を解決しえた．

ここに結果を報告するにあたり，終始御指導を賜った内田俊郎教授に厚くお礼を申上げる．また鞘翅目の同定をしていただいた西京大学中根猛彦助教授，種々の御助言をして下さった河野達郎助教授はじめ研究室の諸氏にお礼を申し上げる．

調査対象と方法

大阪府枚方市内の1農家の穀物倉庫を使用した．倉庫は土造りで南北 8 m，東西 4 m，高さ 5 m で南側に 50 cm 四方の窓が1つ，西側に幅 2m の入口がある．

調査期間は 1954年5月30日～11月3日の間，くん蒸は前年にはおこなわなかったが，1954年には8月4日より4日間 1000 立方尺に1ポンドの割合でクロールピクリンくん蒸をおこなった（第1図）．

前年度に収穫した玄米33俵は10俵ずつ一俵併式に5段につまれ，小麦は5つのフゴに入れて倉庫内の中央部につまれていた．初夏に収穫された大麦はバラ積みのまま戸外で乾燥したのち，くん蒸時に20俵を一俵併式に10俵ずつ倉庫内に積み処理した．

玄米俵は調査期間中不定期に 2～3 俵ずつ搬出され，調査末期に大量の搬出がおこなわれて最後には2俵になったが，12回の調査中9回までは20俵以上がつねに収納されていた．大麦は調査期間中に2俵搬出されたのみである．小麦も1フゴが搬出されただけである．

害虫の種類および個体数は，主としてトラップにより調べたが，補助的に抜き取り法と標識法を使用した．トラップは，Golding[3] の例にならい市販の粉石鹸と水を 6：500 の割合でよく混ぜ，高さ 2.7 cm，径 11.3 cm のバットに入れ毎回 20～25 個を庫内に立体的に設置した．約5ヶ月の調査期間中に大体等間隔の

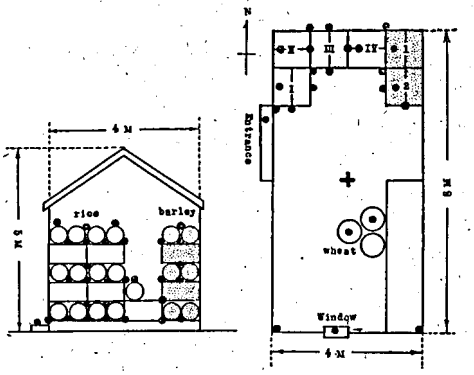

Fig. 1. Illustration of the premises investigated.
+: released point of marked rice weevils.
●: position of trap.

* 京都大学農学部昆虫学研究室業績 第318号.